

Dendrobium longicornu: an addition to the orchid flora of Western Himalaya^a

Soni Bisht¹ & Bhupendra S. Adhikari^{1,*}

Keywords/Mots-clés : Askot WS, Long-horned dendrobium, Nigro-hirsute dendrobium, Uttarakhand.

Abstract

Dendrobium is one of the largest genera of the Orchidaceae. Hitherto, 116 species of the genus have been reported from India, of which 17 (including 2 doubtful taxa) have been recorded from Western Himalaya and 7 from the Askot Wildlife Sanctuary (AWS). By this publication, we add *Dendrobium longicornu* to the flora of Western Himalaya.

Résumé

Dendrobium longicornu : une espèce supplémentaire pour la flore de l'Himalaya occidental – Le genre *Dendrobium* est l'un des genres les plus vastes parmi les Orchidaceae. Jusqu'ici 116 espèces ont été enregistrées pour l'Inde, dont 17 (en comptant deux taxons douteux) pour l'Himalaya occidental et 7 pour le sanctuaire AWS (Askot Wildlife Sanctuary). Le présent article ajoute une espèce, *Dendrobium longicornu*, à la flore de l'Himalaya occidental.

Introduction

Orchidaceae is one of the largest families of flowering plants with an estimate of 24,500 species worldwide (73% epiphytic: Dressler, 2005). Most of the species has been listed under appendix II of CITES, due to their mycorrhizal associations (Gill, 1989; Taylor & Bruns, 1997; McCormick *et al.*, 2004; Otero & Flanagan, 2006; Shefferson *et al.*, 2007), habitat specificity

^a : manuscrit reçu le 6 février 2014, accepté le 10 avril 2014

article mis en ligne sur www.richardiana.com le 11/04/2014 – pp. 157-168 - © Tropicalia

ISSN 1626-3596 (imp.) - 2262-9017 (élect.)

(Linder, 1995; Shefferson *et al.*, 2008) or specialised pollinators (Darwin, 1862; Cozzolino & Widmer, 2005), and are categorized as critically endangered and rare. Often their growth is correlated with environmental conditions of the habitat (Aravindhavan *et al.*, 2011). Orchids have a wide ecological range of distribution, especially in tropical forests of America, Indo-Malayan and East Himalayan regions and contribute to a large extent to the epiphytic community (Dressler, 2005). Their high economic value is due to an incredible range of floral diversity attracting botanists, ecologists, traditional healers and naturalists. The Indian orchid flora comprises 1,331 species (of which 400 are endemic) in 184 genera (Misra, 2007). This makes the Indian orchid flora one of the richest in tropical Asia (Sathishkumar & Manilal, 1990; Dressler, 1981; Joseph, 1982; Santapau & Henry, 1973; Bose & Bhattacharjee, 1980).

Dendrobium is the third largest epiphytic genera of the Orchidaceae with 1,184 species (Leitch *et al.*, 2009) and can be characterised by a mentum made up from the column foot, the lip and the lateral sepals. Its distribution range comprises India, China, South East Asia, Japan, Malaya, Philippines, New Guinea, Australia, Pacific Islands and New Zealand. Papua New Guinea has the highest density with a total of 150 species. In India, the genus is represented by 116 species (Misra, 2007). According to Lokho (2013) the highest number of *Dendrobium* species (82) is recorded from the North-Eastern states, with a hotspot of 49 species in Arunachal Pradesh. In 2011, Kumar *et al.* reported eleven *Dendrobium* species from the Chotanagpur Plateau.

While collecting the data about the composition of the forest and the medicinal plants, one of authors (SB) came across the orchid species, and various parameters such as the habit, slope (habitat inclination), the light conditions, the number of plants in the population and the elevation coordinates of the population were recorded. The specimen was examined and reviewed with the help of various floras (Collett, 1902; Duthie, 1906; Raizada *et al.*, 1981; Vij *et al.*, 1982; 1983; Chowdhery & Wadhwa, 1984; Deva & Naithani, 1986; Pangtey *et al.*, 1991; Pearce & Cribb, 2002; Lucksom, 2007; Misra, 2007; Rokaya *et al.*, 2013) and various research papers in national and international journals (Jalal, 2007; 2012a; 2012b; Jalal *et al.*, 2008a; 2008b). It was identified as *Dendrobium longicornu* Lindley, a species that hitherto never has been recorded from the western Himalaya. The accepted name and its synonyms are given according to the World Checklist of Monocotyledons (Govaerts, 2003).

Results

Ecology

Habitat: *Dendrobium longicornu* (Long-horned *Dendrobium*) is found in conifer-broadleaved mixed forest, coniferous forest or oak forest on the stem and branches of the trees between 1200 and 3000 m elevation. The species was encountered in few quadrats laid for vegetation assessment in oak-conifer forest (*Quercus lanuginosa*, *Q. leucotrichophora* and *Pinus roxburghii*) by the first author.

Host plants: The host species were *Quercus leucotrichophora*, *Q. lanuginosa* with an association of other tree species (*Lyonia ovalifolia*, *Myrica esculenta*, *Pinus roxburghii*, *Pyrus pashia*) and *Rhododendron arboreum*. The plants were growing on the branches of oak species (80-85%) and stems of *Lyonia* (15-20%) in exposed sites (moderate canopy cover and windy) on a south facing gentle slope (< 25°) in Askot WS (Fig. 1). The populations comprised 300 to 350 individuals.

Systematic treatment

Dendrobium longicornu Lindley

Genera and Species of Orchidaceous Plants: 80 (1830).

Homotypic Synonym: *Callista longicornis* (Lindley) Kuntze, *Revisio Generum Plantarum* 2: 655 (1891)

Heterotypic Synonyms:

Froscula hispida Rafinesque, *Flora Telluriana* 4: 44 (1838)

Dendrobium flexuosum W.Griffith, *Notulae ad Plantas Asiaticas* 3: 317 (1851)

Dendrobium hirsutum W.Griffith, *Notulae ad Plantas Asiaticas* 3: 318 (1851)

Dendrobium bulleyi Rolfe, *Notes from the Royal Botanic Garden, Edinburgh* 8:20 (1913)

Dendrobium fredianum hort.

Description

The plant, commonly described as a nigro-hirsute dendrobium which refers to the fine black hairs that cover the pseudobulbs, is a 10-40 cm tall epiphyte. The plant is tufted, minutely sulcate, somewhat fractiflex, several noded. Its roots are fasciculate. The plant carries 5-11 obliquely pointed linear lanceolate deciduous leaves. It blooms on very short, axillary racemes that arise from the top of leafed canes with 1-3, fragrant, waxy, long-lasting flowers. Stems clustered, pendulous, cylindrical, 7-35 cm, 2-4 mm thick, slightly rigid, erect, wavy, unbranched, with many nodes, internodes

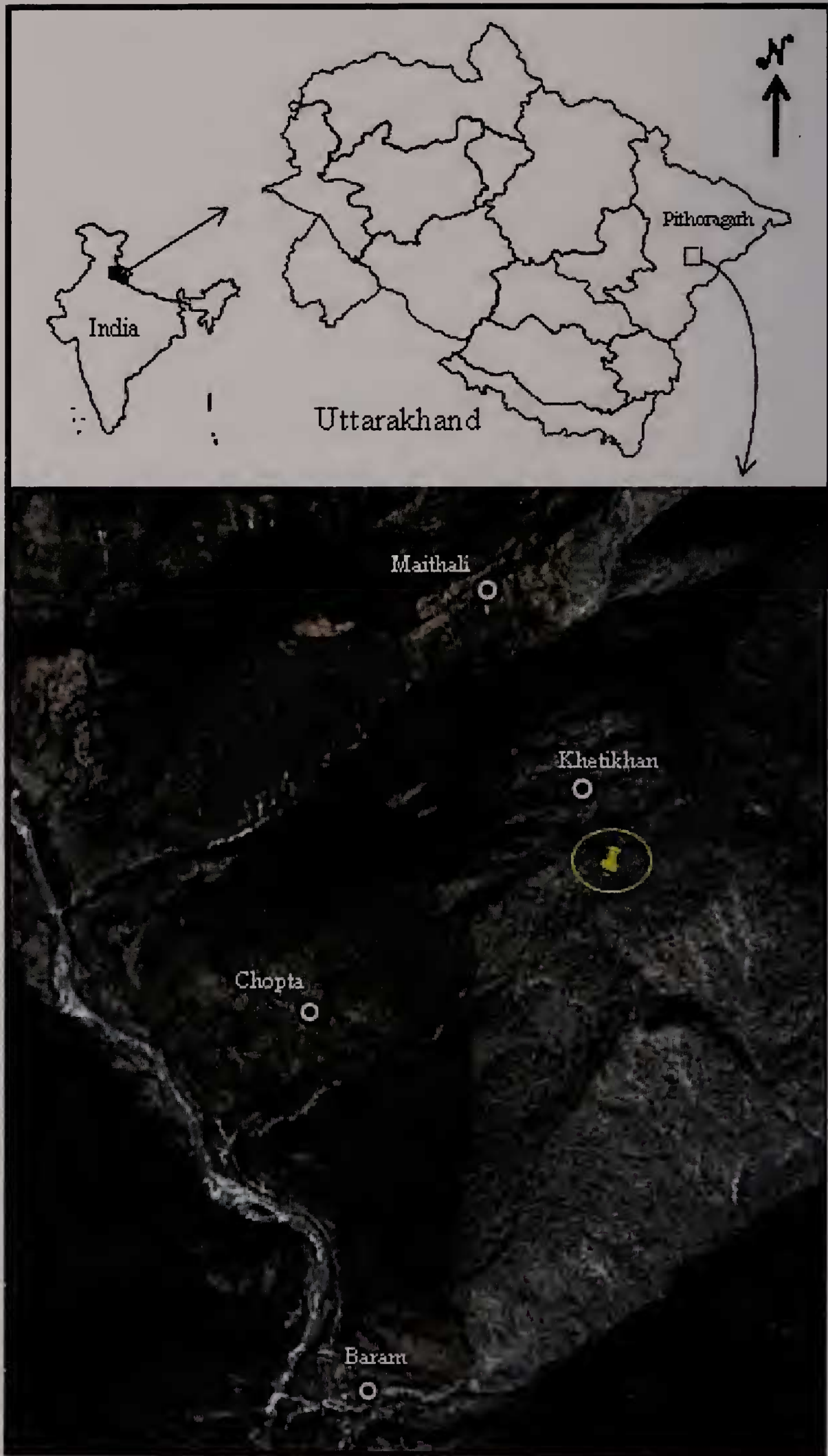


Fig. 1: Location of *Dendrobium longicornu* in Askot Wildlife Sanctuary in the state of Uttarakhand, India (yellow circle)

2-4 cm, sheaths tubular, funnel shaped, black-hairy, 2.5-4 cm long. Leaves 6-10, distichous, lamina ovate-elliptic to oblong-lanceolate, base a tubular clasping sheath, apex acuminate, emarginate, puberulose, leathery, both surfaces with blackish brown rigid hairs including leaf sheaths, sessile, 2.5-8 × 1-2.2 cm. Inflorescence 5-7.5 mm, terminal or axillary racemes on leafless stem with 1-3 pedicellate flowers; peduncle attenuate *ca.* 5 mm, terete, smooth, enveloped by 2-4, 0.4-1.5 cm long, ovate to lanceolate, acute, imbricate scarious sheaths, with black hairs; rachis 0-2 mm, slightly terete, smooth. Pedicel and ovary nearly cylindrical, 2.5-3.5 cm, obscurely ribbed, smooth, slender; floral bracts ovate-lanceolate, 0.5-1.7 cm, subacute to acuminate, coarsely black-hairy, 8 × 3 mm. Flowers white with a lip with yellow or red-orange lamellae, fragrant, 3.0-4.5 cm across, pendulous, pointing downward, cylindrical, often not opening fully, nodding, sepals carinate, mentum straight or hooked, 1.5-2 cm long, forming a spur (Fig. 2). Flowering takes place during rainy season (August-September) and flowers are long lasting (up to December).



Fig. 2: *Dendrobium longicornu*
front (right) and side (left) view of flower

Sepals sub-similar, ovate-lanceolate, acuminate, keeled; dorsal sepal ovate, 1.5-2.0 × *ca.* 0.5-0.7 cm, 7-veined, mid-vein slightly keeled abaxially, apex acute; lateral sepals obliquely ovate-triangular; petals oblong or lanceolate, 15-20 × 4-7 mm, 5-veined, margin irregularly denticulate, apex acute; lip 3-lobed, broadly triangular when spread, 2.2-3.0 × 2.4-2.9 cm; lateral lobes rounded, margins entire to weakly undulate, 2.2-2.5 × 1.0-1.1 cm; mid-lobe small, suborbicular, fimbriate-lacerate, 6-9 mm wide; disc with a broad



Fig. 3: *Dendrobium longicornu*

1: habit; 2: dorsal view of a single flower; 3: lateral view; 4: dorsal sepal; 5: lateral sepals; 6: petals; 7: column (anther *in situ*)

central ridge from base to mid-lobe where it divides into 3 or 4 branches. Column with 2 stelidia at apex, 4-8 mm long; foot 1.0-1.2 cm long, teeth triangular; anther cap nearly flatly conic, front margin densely barbate, apex subtruncate; pollinia four, 1.5-2.0 mm long, in two appressed pairs, ovoid or oblong, without caudicle (Fig. 3).

Overall Distribution

India: East Himalaya (including Arunachal Pradesh, Assam, Meghalaya, Mizoram and Nagaland), Sikkim and Darjeeling in West Bengal (Rao, 2007; Lokho, 2013; Yonzon *et al.*, 2012); China (Zhengyi *et al.*, 2010); Bangladesh (Hossain, 2002); Nepal (Subedi *et al.*, 2013; Rokaya, 2013); Bhutan (Pearce & Cribb, 2002); Myanmar (Tanaka, 2003); Vietnam (Averyanov & Averyanova, 2003) and Thailand (Sathapattayanon *et al.*, 2009; Yukawa, 2009).

Orchid diversity in Western Himalaya

The orchid diversity of the Uttarakhand state of India is 240 species (130 terrestrial, 11 saprophytic and 99 epiphytic) from 73 genera (Jalal *et al.*, 2008a). *Habenaria*, *Dendrobium*, *Bulbophyllum*, *Liparis*, *Oberonia*, *Eulophia*, *Eria*, *Calanthe*, *Cymbidium* and *Herminium* are the most dominant genera in Western Himalaya. The genus *Dendrobium* is represented by seventeen species: *Dendrobium amoenum*, *D. aphyllum*, *D. bicameratum*, *D. candidum*, *D. chrysanthum*, *D. chryseum*, *D. crepidatum*, *D. denudans*, *D. fimbriatum*, *D. fugax*, *D. hesperis*, *D. heterocarpum*, *D. monticola*, *D. normale*, *D. primulinum*, *D. moschatum* and *D. transparens* (Jalal *et al.*, 2012a; Pangtey *et al.*, 1991). The last two species have been treated as doubtful in both studies, as they were collected by Duthei in 1906 and have not been reported again since. With the collection of *Dendrobium longicornu* from Askot WS (Coll. No.:31 dated 23 October, 2013 at 2005 m altitude; Soni Bisht), the number of *Dendrobium* species rises to 18 for Western Himalaya and 8 for Askot WS.

Etymology

The generic name *Dendrobium* has been derived from the greek words '*Dendron*' meaning 'tree' and '*bios*' meaning 'life', referring to the epiphytic nature of the genus. The species epithet is combined from the characteristics of the mentum: '*longus*' meaning 'long' and '*cornu*' meaning 'horn'.

Medicinal Use

The species is very rarely used for medicinal purposes. In Askot, WS, the local people occasionally feed the plants to their goats. The juice of the stems is consumed by humans for the treatment of fever and cough in Nepal and the boiled roots are fed to the livestock when the animals are suffering from cough (Subedi *et al.*, 2013). In the traditional Chinese medicine the stems of several *Dendrobium* species are used as 'Shi-Hu', mainly for throat problems and to enhance the immune system (Ye *et al.*, 2002). Hitherto, fifteen known phenolic compounds have been isolated from the stems of *Dendrobium longicornu* (Hu *et al.*, 2008; 2010).

Trade

Most of the species of orchids are listed under Appendix II and can be traded through export permits (CITES). The data available through the CITES reports suggest that over the last four years living plants of *D. longicornu* have been traded to Germany (80 individuals), USA (40 individuals), France (41 individuals) and Japan (5 individuals), which shows that the trade of *D. longicornu* has been more or less constant over a period of three years (CITES, 2009; 2010; 2012).

Threat

In the present situation the habitat of *Dendrobium longicornu* is not under threat. However, recurrent fire incidences are happening in the lower side of the forest, which is dominated by *Pinus roxburghii*, and may affect the regeneration and establishment of the species in other host species.

Conservation

The presence of maximum number (*ca.* 95%) of *Dendrobium* species in the eastern part of Uttarakhand state *i.e.* Askot WS in particular suggests that it is one of the best suited habitat. Efforts have to be made for the conservation of the genus in the region by conducting awareness programmes for the local youth including school/college students, while, to maintain the gene pool in nature, the frontline staff should be motivated to conserve the genus.

Acknowledgement

The authors are grateful to the Director and Dean, Wildlife Institute of India (WII) for providing the necessary facilities. The authors thank Mr. V.K. Uniyal, Project Coordinator, Biodiversity Conservation and Rural Livelihoods Improvement Project (BCRLIP) of WII for encouragement and fellow project colleagues for their support in the field. We also thank Dr. Pankaj Kumar, Orchid Conservation Section, Kadoorie Farm and Botanic Garden (KFBG) Corporation, Hong Kong for his assistance with the identification of the plant. Thanks are also due to the anonymous peer reviewers for providing constructive suggestions and comments.

References

- Aravindhavan, V., K.Sathiyadas, A.Rajendran & T.Binu, 2011. Some rare/endemic medicinal orchids of Vellanghiri hills of Southern Western Ghats, Tamil Naidu, India. *The Indian Forester* 137 (9):1077-1081.
- Averyanov, L.V. & A.L.Averyanova, 2003. Updated checklist of the orchids of Vietnam. Vietnam National University Publishing House, Hanoi. 102pp.
- Bose, T.K. & S.K.Bhattacharjee, 1980. *Orchids of India*. Calcutta.
- Chowdhery, H.J. & B.M.Wadhwa, 1984. *Flora of Himachal Pradesh: An Analysis*. Volume I-III. Botanical Survey of India, Howrah.
- CITES, 2009. *Annual Report*. Govt. of India, Ministry of Environment and Forests. Published by CITES Management Authority in India, Govt. of India.
- CITES, 2010. *Annual Report*. Govt. of India, Ministry of Environment and Forests. Published by CITES Management Authority in India, Govt. of India.
- CITES, 2012. *Annual Report*. Govt. of India, Ministry of Environment and Forests. Published by CITES Management Authority in India, Govt. of India.
- Collett, H., 1902. *Flora of Simlensis*. Thacker, Spink and Co., Shimla.
- Cozzolino, S. & A.Widmer, 2005. Orchid diversity: An evolutionary consequence of deception? *Trends in Ecology & Evolution* 20: 487-494.
- Darwin, C., 1862. *The various contrivances by which orchids are fertilised by insects*. John Murray, London, UK.
- Deva, S. & H.B.Naithani, 1986. *The orchid flora of north-west Himalaya*. New Delhi.
- Dressler, L., 2005. How many orchid species? *Selbyana* 26: 155- 158.
- Dressler, R.L., 1981. *The orchids. Natural history and classification*. Cambridge: Harvard University Press.

- Duthie, J.F., 1906. The Orchids of the North-Western Himalaya. *Annals of the Royal Botanical Garden, Calcutta*, 9(2): 81-211.
- Gill, D.E., 1989. Fruiting failure, pollinator inefficiency and speciation in orchids. In: Otte, D. & J.A. Endler (eds.), *Speciation and its consequences*, 458-481. Sinauer, Sunderland, Massachusetts, USA.
- Govaerts, R., 2003. *World Checklist of Monocotyledons Database in ACCESS: 1-71827*. The Board of Trustees of the Royal Botanic Gardens, Kew.
- Hu, J., W.Fan, Z.Lu, Y.Zhao & J.Zhou, 2010. A New Phenolic Compound from *Dendrobium longicornu*. *Bulletin of the Korean Chemical Society* 31(10): 3025-3026. doi 10.5012/bkcs.2010.31.10.3025.
- Hu, J.M, J.J.Chen, H.Yu, Y.X.Zhao & J.Zhou, 2008. Five new compounds from *Dendrobium longicornu*. *Planta Medica* 74(5): 535-539. doi: 10.1055/s-2008-1074492
- Jalal, J.S., 2012a. Status, threats and conservation strategies for orchids of western Himalaya, India. *Journal of Threatened Taxa* 4(15): 3401-3409.
- Jalal, J.S., 2012b. Distribution pattern of orchids in Uttarakhand, Western Himalayas, India. *International Journal of Plant Biology* 3(e5): 24-26.
- Jalal, J.S., 2007. Orchids of Uttaranchal: A Plea for Conservation. *MIOS Journal* 8(10): 11-14.
- Jalal, J.S., P.Kumar, G.S.Rawat & Y.P.S.Pantgtey, 2008a. List of Species Orchidaceae, Uttarakhand, Western Himalaya, India. *Checklist* 4(3): 304-320.
- Jalal, J.S., G.S.Rawat & P.Kumar, 2008b. Abundance and habitat types of orchids in Gori Valley, Eastern Uttarakhand. *Journal of the Orchid Society of India* 22 (1-2): 63-67.
- Joseph, J., 1982. Conservation is preservation plus regeneration. In: S. Chandra *et al.*, (eds.). *Proceedings of the Symposium Development without Destruction*, 106-111. Shillong.
- Khan, M.S., M.M.Rahman & M.A.Ali (eds), 2001. *Red Data Book of Vascular Plants of Bangladesh*. Bangladesh National Herbarium, Dhaka, pp. 1-179.
- Kumar, P., G.S.Rawat & H.P.Wood, 2011. Diversity and Ecology of *Dendrobiums* (Orchidaceae) in Chotanagpur Plateau, India. *Taiwania* 56(1): 23-36.
- Linder, H.P., 1995. Setting conservation priorities -The importance of endemism and phylogeny in the southern African orchid genus *Herschelia*. *Conservation Biology* 9: 585-595.
- Lokho, A., 2013. Diversity of *Dendrobium* Sw. Its distributional patterns and present status in the Northeast India. *International Journal of Scientific and Research Publications* 3(5): 1-9.

- Lucksom, S.Z., 2007. *The orchids of Sikkim and North East Himalaya*: 1-984. S.Z. Lucksom, India.
- McCormick, M.K., D.F.Whigham & J.O'Neill, 2004. Mycorrhizal diversity in photosynthetic terrestrial orchids. *New Phytologist* 163: 425-438.
- Misra, S., 2007. *Orchids of India, a glimpse*. Bishen Singh Mahendra Pal Singh, Dehradun.
- Otero, J.T. & N.S.Flanagan, 2006. Orchid diversity. Beyond deception. *Trends in Ecology and Evolution* 21: 64-65.
- Pangtey, Y.P.S., S.S.Samant & G.S.Rawat, 1991. *Orchids of Kumaon Himalaya*. Bishan Singh Mahendra Pal Singh, Dehradun.
- Pearce, N.R. & P.J.Cribb, 2002. *Orchids of Bhutan*. Published by RGoB and RBGE.
- Raizada, M.B., H.B.Naithani & H.O.Saxena, 1981. *Orchids of Mussoorie*. Bishan Singh Mahendra Pal Singh, Dehradun.
- Rao, A.N., 2007. Orchid Flora of North East India - an up to date analysis. *Bulletin of Arunachal Pradesh Forest Research* 23(1&2): 6-38.
- Rokaya, M.B., B.B.Raskoti, B.Timsina & Z.Münzbergová, 2013. An annotated checklist of the orchids of Nepal. *Nordic Journal of Botany* 31: 511-550.
- Santapau, H. & A.N.Henry, 1973. *A dictionary of the flowering plants of India*. Council of Scientific & Industrial Research, New Delhi.
- Sathapattayanon, A., T.Seelanan & T.Yukawa, 2009. *Dendrobium hirsutum* Griff. (Orchidaceae), a new recorded species from Northeastern Thailand. *The Natural History Journal of Chulalongkorn University* 9(1): 85-89.
- Sathishkumar, C. & K.S.Manilal, 1994. *A catalogue of Indian Orchids*. Bishen Singh Mahendra Pal Singh, Dehradun.
- Shefferson, R.P., D.L.Taylor, M.Weiß, S.Garnica, M.K.McCormick, S.Adams, H.M.Gray, J.W.McFarland, T.Kull, K.Tali, T.Yukawa, T.Kawahara, K.Miyoshi & Y.-I.Lee, 2007. The evolutionary history of mycorrhizal specificity among lady's slipper orchids. *Evolution* 61: 1380-1390.
- Shefferson, R.P., T.Kull & K.Tali, 2008. Mycorrhizal interactions of orchids colonizing Estonian mine tailings hills. *American Journal of Botany* 95: 156-164.
- Subedi, A., B.Kunwar, Y.Choi, Y.Dai, T.vanAndel, R.P.Chaudhary, H.J.deBoer & B.Gravendeel, 2013. Collection and trade of wild-harvested orchids in Nepal. *Journal of Ethnobiology and Ethnomedicine* 9(64): 1-10.
- Taylor, D.L. & T.D.Bruns, 1997. Independent, specialized invasion of ectomycorrhizal mutualism by two nonphotosynthetic orchids. *Proceedings of National Academy of Science, USA* 94: 4510-4515.

- Vij, S.P., I.S.Toor & N.Skekhar, 1982. Observations on orchidaceous flora of Shimla and adjacent hills in the NW Himalayas (ecology and distribution). *Research Bulletin of Panjab University* 33(3&4): 163-175.
- Vij, S.P., N.Shekhar, S.K.Kashyap & A.K.Garg, 1983. Observations on the orchids of Nainital and adjacent hills in the Central Himalaya (Ecology and Distribution). *Research Bulletin of Panjab University* 34(3): 63-76.
- Ye, Q.H., W.M. Zhao & G.W. Qin, 2002. *The Progress in Medicinal Chemistry*; In: Peng, S.X. (ed.), Chemical Industry Press, 3: 113p.
- Yonzon, R., D.Lama, R.B.Bhujel & S.Rai, 2012. Orchid species diversity of Darjeeling Himalaya of India. *International Journal of Pharmacy and Life Sciences* 3(3): 1533-1550.
- Yukawa, T., 2009. *Dendrobium hirsutum* Griff. (Orchidaceae), a new recorded species from Northeastern Thailand. *The Natural History Journal of Chulalongkorn University* 9(1): 85-89.
- Zhengyi, W., P.H.Raven & D.Hong (eds), 2010. *Flora of China* 23: 174-176. Science Press, Beijing & Missouri Botanical Garden Press, St Louis.
- Leitch, I.J., I.Kahandawala, J.Suda, L.Hanson, M.J.Ingrouille, M.W.Chase & M.F.Fay, 2009. Genome size diversity in orchids: consequences and evolution. *Annals of Botany* 104 (3): 469-481.
- Hossain, A.B.M.E, 2002. A taxonomic report on the genus *Dendrobium* Sw. (Orchidaceae) from Bangladesh. *Bangladesh Journal of Plant Taxonomy* 9: 47-55.
- Tanaka, Y. 2003. *Wild Orchids in Myanmar*, Volume I: Last Paradise of Wild Orchids. Foundation of Agricultural Development and Education.

1 : Department of Habitat Ecology, Wildlife Institute of India, P.O. Box # 18, Chandrabani, Dehradun 248 001, Uttarakhand, India

* author for correspondance: adhikaribs@wii.gov.in